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# Inflation in Pre-Crisis Mexico: A Monetarist Interpretation of the Relative Importance of Internal and External Factors

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# **Inflation in Pre-Crisis Mexico: A Monetarist Interpretation of the Relative Importance of Internal and External Factors**

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El propósito de este ensayo es examinar las causas básicas de la inflación mexicana en los 70 y así formar una idea de las causas por la aceleración de la inflación en los 80. A pesar de que algunos factores estructurales fueron la causa de parte de la presión durante este período, este estudio revela que casi todos los aumentos de los precios se deben a factores monetarios.

## **Introduction**

After many years of price stability, Mexico's inflation began to accelerate in the 1970s, increasing at an average annual rate of 12.08 percent during the 1970-75 period to 21.22 percent per annum during 1975-80, and finally accelerating to an average annual rate of 60.68 percent between 1980 and 1985. Clearly, the country's current bout of inflation has many of its origins in developments that occurred in the 1970s.

The main purpose of the analysis below is to examine the specific underlying causes of Mexican inflation in the 1970s and its general determinants over the 1950-79 period. Hopefully, this analysis will provide some insights into the inflationary process currently taking place in Mexico and the policy measures most likely to be effective in controlling the overall increase in domestic prices.

The overall conclusion of the study is that while structural factors were undoubtedly responsible for some of the inflationary pressures during this period, nearly all of the increase in prices can be accounted for by monetary factors.

### External Links

There is a widespread view both within and outside of Mexico that the country's acceleration of inflation beginning in the early 1970s was a special one, a commodity inflation caused particularly by international forces, including two devaluations of the dollar (to which the peso was pegged). Both the Bank of Mexico in its annual reports and the office of the Presidency in its annual *informe* have articulated this view. The first step in the analysis below, therefore, is to determine, as an empirical matter, the extent to which Mexican inflation can, in fact, be attributable to external events. Or, as the case may be, the extent to which domestic events and policies are to blame for the acceleration in prices during the 1970s.

Interestingly enough, at least in the early part of the 1970s, developments similar to those taking place in Mexico were, to a large extent, experienced by a wide number of developing countries. As with Mexico, inflation in most of these countries was beginning to be significant in 1971-72 and simultaneously becoming rapid in 1973 (Table A1). Furthermore, almost all countries experienced a rate of inflation in 1973-74 that was either close to their historical peaks or set new record highs.

It is this universal and synchronous pattern of worldwide inflation in the 1970s that makes this period unique. Explanations<sup>1</sup> of the worldwide pattern of price increases range from crop failures and the oil shock to excessive monetary supply, generalized wage-push and disputes over the division of income. Four channels have been identified through which inflation may have been transmitted internationally during this period: (1) external demand, operating through the trade account, may have bid up the prices of domestic goods (assuming either that there was full employment or that the elasticity of supply of exportable goods was low); (2) external price movements may have brought the prices of domestic goods in line with those of traded goods; (3) excess liquidity may have been created by increased external reserves (which encouraged spending on goods whose prices rose until the equilibrium level of real

1. Robert Looney, *The Economic Consequences of World Inflation on Semi-Dependent Countries* (Washington: University Press of America, 1979); see also Lawrence Krause and Walter Salant, eds., *Worldwide Inflation: Theory and Recent Experience* (Washington: Brookings Institution, 1977); David Meiselman and Arthur Laffer, eds., *The Phenomenon of Worldwide Inflation* (Washington: American Enterprise Institute for Public Policy Research, 1975), and Michael Parkin and George Zis, eds., *Inflation on Open Economies* (Manchester: Manchester University Press, 1976).

balances was restored); and (4) indirect stimuli such as more aggressive international trade union activity, increased social tensions and international inflationary expectations may have been increasingly active at this time.

As noted, Mexico's current inflation began in 1973, and in many regards this is the most productive period to examine in detail. For one thing, causation is much more difficult to establish once inflation has been underway for some time.

For another, movements in monetary factors<sup>2</sup> usually listed as major contributory elements in the inflationary process were experiencing particularly wide fluctuations in the late 1960s and early 1970s, thus making their impact easier to identify through standard regression techniques.

### **Inflationary Pressures 1973–1974**

One of the most popular explanations of the 1973–74 world-wide inflation (and Mexico's as well) is the Organization of Petroleum Exporting Countries (OPEC) price increases. Ironically, this is the easiest source of inflationary pressure to dispose of. In terms of timing, the OPEC price increases did not take place until late in 1973 (November). It is clear, however, that prices around the world were increasing well in advance of the OPEC action (some of the effects of the higher oil prices are contained in the 1973 inflation rates, of course).

The worldwide bad weather of 1972–73 and subsequent poor food harvests were undoubtedly contributory factors to the country's subsequent inflation, but neither weather nor increased food prices can explain the duration of the inflation. The expansion of excess liquidity (especially before 1973) would appear more logical in this regard.

In contrast to the pattern of inflation which began to develop in 1973, there was a large growth in the money supply in 1972 (Table 1). Of the twenty-six sample countries whose past inflation rates can be regarded as normal, (Argentina, Brazil, Chile and Indonesia are excluded from the normal group because they have

2. These channels may be incorporated in the monetary theory of the balance of payments. Cf. Harry Johnson, "The Monetary Approach to the Balance of Payments Theory," in H. Johnson, *Further Essays in Monetary Economics* (Cambridge: Harvard University Press, 1973); and Michael Parkin, "A Monetarist Analysis of the Generation and Transmission of World Inflation: 1958–1971," *American Economic Review* (February 1977): 164–171.

**Table A1** *Rate of Change in the Consumer Price Index, Thirty Developing Countries, 1956-1976*

*Percent*

<i>Country</i>	<i>Annual Average<sup>a</sup></i>			<i>Peak</i>	<i>Annual Average<sup>a</sup></i>					<i>Acceleration in 1972 over 1966-70</i>
	<i>1956-60</i>	<i>1961-65</i>	<i>1966-70</i>	<i>1956-70</i>	<i>1971-72</i>	<i>1972</i>	<i>1973</i>	<i>1973-74</i>	<i>1975-76</i>	
Argentina	41.8	23.2	n.a. <sup>b</sup>	111.1	46.8	58.5	60.7	42.1	313.2	n.a.
Bolivia	65.8	5.2	6.0	11.2	5.1	6.6	31.5	47.8	6.3	0.6
Brazil	25.6	63.0	n.a.	87.0	18.3	16.4	12.7	20.2	35.3	n.a.
Chile	29.4	28.6	26.8	46.0	49.2	79.1	351.9	428.7	293.2	52.3
Colombia	9.5	12.9	10.2	32.2	11.7	14.3	22.8	23.6	21.5	4.1
Dominican Republic	0.1	2.8	1.3	9.2	6.1	7.9	15.1	14.1	11.1	6.6
Ecuador	-0.1	3.9	4.7	6.5	8.2	7.9	13.0	18.1	n.a.	3.2
Egypt	1.4	3.4	4.2	14.9	2.6	2.1	4.3	7.6	10.0	-2.1
El Salvador	0.4	0.2	1.1	5.7	1.0	1.5	6.4	11.6	15.1	0.4
Ghana	1.7	11.0	4.1	25.4	8.0	13.5	10.2	17.2	46.9	9.4
Guatemala	-0.2	0.1	1.5	2.4	0.1	0.6	13.8	15.1	11.9	-0.9
India	5.2	6.0	6.9	13.8	4.4	5.8	17.4	22.4	-1.0	-1.1
Indonesia	20.1	83.8	n.a.	n.a.	9.1	12.7	31.5	36.0	19.4	n.a.

**Table 1** *Rate of Growth of the Money Supply, Thirty Developing Countries, 1956-76<sup>a</sup>**Percent*

<i>Country</i>	<i>Annual Average</i>			<i>Peak</i>	<i>Annual Average<sup>b</sup></i>				<i>Acceleration in 1972 over 1966-70</i>
	<i>1956-60</i>	<i>1961-65</i>	<i>1966-70</i>	<i>1956-70</i>	<i>1971-72</i>	<i>1972</i>	<i>1973-74</i>	<i>1975-76</i>	
Argentina	53.8	18.6	10.2	23.0	17.2	22.4	39.2	20.6	12.2
Bolivia	53.8	18.6	10.2	23.0	17.2	22.4	39.2	20.6	12.2
Brazil	29.1	65.8	n.a.	87.4	32.8	34.6	39.9	37.4	n.a.
Chile	23.3	37.8	n.a.	104.5	103.8	105.7	296.7	265.2	n.a.
Colombia	n.a. <sup>c</sup>	18.4	19.8	24.0	15.4	20.6	27.1	21.9	0.8
Dominican Republic	n.a.	4.9	6.8	15.7	11.9	12.6	23.6	9.0	9.8
Ecuador	6.3	9.9	15.5	25.1	18.0	17.6	38.8	22.2	2.1
Egypt	n.a.	10.4	4.0	20.2	9.4	13.0	24.0	23.4	9.0
El Salvador	1.5	3.8	3.9	12.4	9.3	11.3	25.1	22.4	7.4
Ghana	6.2	16.8	4.7	26.1	19.0	38.8	22.8	42.5	34.1
Guatemala	5.6	6.3	4.5	14.3	10.3	14.6	23.7	23.1	10.1
India	6.5	9.0	9.5	11.9	12.7	12.5	15.3	11.4	3.0
Indonesia	29.9	n.a.	n.a.	n.a.	30.0	33.8	41.0	30.5	n.a.
Iran	17.5	12.1	10.5	26.6	23.7	32.6	26.6	41.5	n.a.

Iran	6.9	2.0	1.4	11.2	5.3	6.4	9.8	11.9	12.1	5.0
Iraq	2.1	1.1	3.5	6.5	4.4	5.2	4.9	6.6	9.9	1.7
Korea, Republic of	11.2	15.2	11.4	27.9	12.1	11.7	3.0	13.4	28.4	-0.2
Malaysia	0.4	0.5	1.4	4.6	2.4	3.2	10.6	14.0	3.6	2.8
Mexico	5.9	1.9	3.7	12.2	5.4	5.0	11.4	16.9	16.5	1.3
Morocco	3.6	4.0	0.6	6.1	3.9	3.7	4.2	10.9	8.2	3.1
Nigeria	4.1	2.8	5.9	13.9	9.4	2.8	6.0	9.2	27.6	0.1
Pakistan	4.1	2.0	4.5	11.3	7.2	5.1	23.1	24.9	14.0	0.6
Peru	8.5	9.0	9.8	19.0	7.0	7.1	9.5	13.2	28.6	-2.7
Philippines	2.2	4.7	6.1	14.4	12.4	10.2	11.0	22.7	7.1	4.1
Sri Lanka	0.6	1.7	4.2	7.4	4.5	6.3	9.6	10.9	4.0	2.1
Sudan	1.0	3.3	3.9	12.6	6.2	10.9	17.9	22.0	12.8	7.0
Syria	4.3	0.6	3.3	14.7	3.0	1.0	19.8	17.4	15.6	-2.0
Taiwan	11.2	2.4	4.4	n.a.	2.8	2.9	8.2	27.8	3.9	-1.5
Thailand	2.4	1.5	2.6	6.2	3.0	3.9	11.7	17.5	4.1	1.3
Tunisia	2.7	2.7	2.9	13.5	3.9	2.1	4.6	4.4	7.4	-0.8
Venezuela	2.4	0.4	1.6	5.0	3.1	2.9	4.1	6.2	8.9	1.0

SOURCE: *International Financial Statistics*, various issues.

(a) Single years refer to price rises over the previous year's level, two or more years to an average over those years.

(b) n.a. = not available.

Iraq	17.5	6.1	9.3	44.8	7.0	11.8	27.0	31.1	2.5
Korea, Republic of	18.3	22.9	35.9	45.7	26.6	32.6	38.8	27.0	-3.3
Malaysia	6.8	4.9	6.2	15.9	10.7	14.5	27.2	11.8	8.3
Mexico	10.6	11.5	11.2	11.1	10.9	14.2	21.6	22.1	3.0
Morocco	n.a.	7.3	8.2	23.8	12.5	16.6	20.1	19.3	8.4
Nigeria	n.a.	9.6	16.1	51.9	10.7	7.8	30.6	69.8	-8.3
Pakistan	7.4	7.4	9.2	16.9	18.7	20.2	8.9	17.4	11.0
Peru	n.a.	17.3	19.4	43.7	23.4	22.2	30.1	24.3	2.8
Philippines	n.a.	8.7	11.0	27.5	16.6	18.7	23.0	15.3	7.7
Sri Lanka	3.7	6.9	3.7	10.9	6.8	6.9	15.2	12.9	3.2
Sudan	11.5	11.8	13.0	20.5	6.6	7.0	27.9	18.0	-6.0
Syria	9.6	9.4	13.9	19.3	13.1	17.3	35.5	24.1	3.4
Taiwan	15.2	21.7	17.7	36.4	24.1	20.4	29.8	19.9	2.7
Thailand	6.9	6.2	7.1	12.2	11.5	12.7	17.7	10.5	5.6
Tunisia	n.a.	9.5	2.9	21.2	19.5	21.0	17.5	15.1	18.1
Venezuela	8.7	7.2	6.6	27.9	16.1	20.7	27.5	37.7	14.1

SOURCE: *International Financial Statistics*, various issues.

(a) Money supply refers to cash and demand deposits.

(b) Single year refers to price rises over previous year's level, two or more years to an average over those years.

(c) n.a. = Not available.



suffered hyperinflation in the past), eight showed much higher rates of growth in the money supply during 1972 than at any other time between 1956 and 1970. In addition only one country showed a higher rate of inflation between 1956 and 1970 than in 1973.<sup>3</sup>

Not only were the 1972 rates of growth in the money supply high in most countries (compared with past rates), but the jump from historical levels seems to have occurred almost simultaneously. The average growth in the money supply for the group of normal (non-hyperinflation) countries ranged from 8.6 percent to 12.5 percent during 1961–69. It increased to 14.6 percent in 1970, expanding to 17.7 percent in 1972. Significantly, the average growth in consumer prices did not increase above its 1961–72 range of 2.3 percent to 5.8 percent until 1973.

These patterns were unprecedented. In normal times, the acceleration in the rate of growth of the money supply and prices over their historical increases would be expected to be zero. And indeed, this was the case in 1972 with the acceleration in prices (over the 1966–70 average) ranging for the above sample of countries from –0.8 to 0.7. In 1973, however, prices accelerated by 5.9%, increasing to 7.6% in 1974. In contrast, the acceleration of money supply during 1968–71 had a range of 3.0 to 2.6 for the sample countries, increasing to 6.1 in 1973 and even further to 7.4 in 1974.<sup>4</sup>

In sum, there is no question that at least for the 1970–72 period, the acceleration in the money supply preceded the acceleration in prices. Causation would thus seem to be from money to prices, rather than is often hypothesized by Keynesians from prices to money.<sup>5</sup> More precisely, increases in the money supply were not the result of an accommodating monetary policy, and more importantly, the acceleration in the money supply in 1972 (and in prices in 1973–74) was worldwide.

As can be seen in the comparative tables, movements in prices and money in Mexico closely followed these worldwide patterns. If there is any doubt that the initial inflationary pressures were monetary, it should be noted that in 1972 and 1973 the deviations of real GDP in Mexico did not lie appreciably above the long run trend. Neither growth rates nor their deviation from the trend can

3. Surjit Bhalla, "The Transmission of Inflation into Developing Economies," in William Cline, ed., *World Inflation and the Developing Countries* (Washington: The Brookings Institution, 1981), 54.

4. Ibid., 54.

5. See N. Kaldor, "Inflation and Recession in the World Economy," *The Economic Journal* (December 1976): 703–714, for an exposition of the prices-money causal mechanism for this period.

explain the extraordinary increase in money supply in 1972. Furthermore, similar periods of expansion have occurred before without a corresponding acceleration in consumer prices.

### Domestic Causes of Expansion of the Money Supply

Little evidence has been found so far that purely domestic causes were responsible for the acceleration of money supply in Mexico in 1970–72. Crop failures and lagging food supply, which have been assigned a prominent position in the structuralist list of causes of inflation, however, could have played an important role at this time.

In terms of food production on a per capita basis, Mexico's performance was substandard, declining by 3.6 in 1972 and 1.9 in 1973 (with 1961–65 = 100 the index of per capita food production was 110 in 1971).

Whether this was sufficient to induce an increase in the domestic money supply is much more uncertain. The structuralist's argument that lagging agricultural supply causes inflation is based on the assumption that: (1) food prices are flexible; (2) non-food prices are relatively fixed; and (3) that imports are not used extensively to maintain a stable price level.<sup>6</sup> If foreign exchange shortages dictate a policy of permitting only essential imports, a food shortage can, by inducing an increase in the relative price of food, initiate a period of inflation; i.e., to avoid a severe decline in output when prices in the nonfarm sector are sticky, an increase in the relative price of food would most likely have to be financed by an increase in nominal money, and thus leading to inflation.

On the surface this argument seems to have some merit in the Mexican case. In terms of the pattern of food prices, Mexico's relative food prices actually declined from a base of 1970 = 1.00 to 0.93 in 1972. Thereafter, they rose to 1.09 in 1973 and to 1.47 in 1974. A closer examination of quantitative data, however, reveals that while food prices began to rise in mid-1973, the money supply had been increasing at an accelerated pace all through 1972. Food shortages may therefore have had a limited role in causing the money supply growth of 1972, with at most the food decline exacerbating the acceleration of the money supply. On the other hand, the decline in food production and increased prices of food imports can not be completely ruled out as having played a significant role in the overall 1973–74 price acceleration. Wage increases were not

6. Susan Wachter, *Latin American Inflation* (Lexington, Mass.: Lexington Books, 1976), 11–12.

excessive (Table A2) and are easily disposed of as a major contributory factor to the money supply increases.

Clearly, then, the government budget is the logical place to begin any analysis of the expansion in the money supply. Although Mexico's financial markets are relatively developed by Latin American standards, they are not developed to the extent that large scale non-inflationary financing of the government deficit is possible through the issuance of public bonds. In the final analysis, if the government cannot mobilize domestic savings, the budget deficits must be financed by creating money.

Budget deficits as a percentage of gross domestic product increased from 0.81 percent in 1970 to 2.04 percent in 1972, 3.06 in 1973, and 3.61 in 1974, (Table A3).

The deficits in turn created a number of dilemmas for the Bank of Mexico.<sup>7</sup> In particular, the bank had to decide the source of funds to draw upon to finance the government deficit. This process entailed a series of steps. First, the bank had to estimate the amount of credit that would be available from foreign sources. After this was determined, the levels to be financed with domestic credit were set. If the amounts of domestic funds needed were impossible to raise, the bank often attempted to attract more foreign savings into the Mexican banking system (through increasing the interest differential vis-à-vis international financial centers). The interest rate differential together with the reputation for political and economic stability that Mexico had earned in the 1960s acted as an incentive for increased amounts of savings.

Therefore, besides helping to finance the current account deficit of the balance of payments, foreign savings were used to finance the government's budget deficits. To facilitate this process, banks were obliged to invest their required reserves in government bonds or in selected sectors of the economy. In essence, since these legal reserves were imposed on all the funds, the banks received the funds for government financing regardless of their origin.<sup>8</sup>

If the total amount of available funds (foreign plus domestic) were sufficient to finance the government deficit, the Bank of Mexico would be in a neutral position, neither expanding nor reducing its holdings of international reserves. On the other hand, if all of

7. Gilberto Escobedo, "The Response of the Mexican Economy to Policy Actions," Federal Reserve Bank of St. Louis, *Review* (June 1973): 19; see also Gilberto Escobedo, "Formulating a Model of the Mexican Economy," Federal Reserve Bank of St. Louis, *Review* (July 1973): 8-19, for an excellent summary of the applicability of various macroeconomic models to the Mexican economy.

8. Escobedo, "The Response of the Mexican Economy to Policy Actions," 20.

**Table A2 Mexico: Selected Growth Rates, 1968–1980***Average Annual Rates of Growth*

	<i>Wholesale Prices Mexico City</i>	<i>Consumer Prices Nationwide</i>	<i>Implicit Deflator of GDP</i>	<i>GDP 1960 Prices</i>	<i>Total Money Supply</i>	<i>Currency and Coin</i>	<i>Demand Deposits</i>	<i>Urban Minimum Wages</i>	<i>Real Manufacturing Wages</i>	<i>Total Reserves Minus Gold</i>	<i>Foreign Assets Bank of Mexico</i>
<i>Year</i>	<i>1954 = 100</i>	<i>1978 = 100</i>	<i>1960 = 100</i>								
1968	2.0	0.8	2.4	8.1	12.9	13.0	12.9	0.0	0.0	17.1	7.1
1969	2.6	3.4	3.9	6.3	11.6	11.3	11.9	0.0	2.6	0.2	5.0
1970	6.0	5.3	4.5	6.9	10.5	10.4	10.5	16.3	0.9	15.2	3.5
1971	3.7	5.3	4.5	3.4	8.3	8.3	8.2	0.0	2.4	32.4	24.5
1972	2.8	5.0	5.6	7.3	21.2	22.8	20.1	18.3	2.4	29.8	30.6
1973	15.7	12.0	12.4	7.6	24.2	27.6	21.7	5.2	0.3	18.9	7.0
1974	22.5	23.8	24.0	5.9	22.0	25.1	19.9	35.9	4.0	6.7	1.1
1975	10.5	15.2	16.7	4.1	21.3	22.4	20.5	16.0	4.8	11.7	10.8
1976	22.2	15.8	21.7	2.1	30.9	52.8	13.5	29.3	9.0	- 14.1	39.8
1977	41.2	28.9	32.0	3.3	26.6	11.0	43.3	27.9	2.0	38.8	5.0
1978	15.8	17.5	18.1	7.3	32.6	29.5	35.2	13.5	- 3.1	11.7	17.0
1979	18.3	18.2	20.7	8.0	33.1	30.3	35.6	16.8		10.4	33.3
1980	24.5	26.3	30.0	7.4	33.7	32.0	34.9	17.8		39.3	31.8

SOURCE: Compiled from data in Banco de México, *Informe Anual*, various issues; Banco de México, *Indicadores Económicos*, various issues.

**Table A3** *Public Sector Expenditure, Borrowing<sup>a</sup> and GDP, 1972–1980**Billions, current pesos*

<i>Year</i>	<i>GDP</i>	<i>Increase Percent</i>	<i>Expenditure</i>	<i>Ratio Percent</i>	<i>Gross Borrowing</i>	<i>Ratio Percent</i>	<i>IPD<sup>b</sup></i>
(1)	(2)	(3)	(3)/(1)	(4)	(4)/(1)	(5)	
1972	512.3	13.2	147.3	28.7	37.5	7.3	5.6
1973	619.6	20.9	204.0	32.9	62.3	10.1	12.4
1974	813.7	31.3	276.5	34.0	76.5	9.4	24.0
1975	988.3	21.5	400.7	40.5	137.1	13.9	16.7
1976	1228.0	24.3	530.2	43.2	157.4	12.8	21.7
1977	1674.7	36.4	730.6	44.6	250.0	14.9	32.1
1978	2104.6	25.7	938.6	44.6	317.4	15.1	17.4
1979	2704.4 <sup>c</sup>	28.5	1124.3	46.1	487.7	18.0	19.5
1980	3650.9 <sup>c</sup>	35.0	1683.4	46.1	465.8	27.6	25.3

SOURCE: Constructed from Banco de México annual reports and budget tables, 1972–1980.

(a) The actual total gross borrowing is given, except in 1979, when it is the estimated actual, and in 1980, when it is the budgeted.

(b) IPD is the implicit price deflator of GDP.

(c) Estimated, as explained in the text.

these funds were not enough to finance the government deficit, the bank would have to consider direct credit to the Treasury, even at the risk of overstimulating total demand.<sup>9</sup>

If the threat of excess aggregate demand became very serious, the Bank of Mexico would have to take compensatory action on private credit (so that the nation's overall economic goals would not be endangered). In this case, the bank would most likely reduce bank credit to allow Mexico's stock of international reserves to remain unchanged (thus assuring the goals of maintenance of a stable exchange rate together with free convertibility).

Summing up, one could conclude that government expenditures are the main exogenous variable in the short term. The Bank of Mexico authorities were quite clearly in 1972 left in the rather compromising situation of either reducing the amount of funds available to the private sector or suffering a reduction in foreign exchange holdings.<sup>10</sup>

9. Ibid.

10. For an alternative and quite different interpretation, see E. V. K. Fitzgerald, "Capital Accumulation in Mexico," *Development and Change* (July 1980): 391–414. Fitzgerald criticizes this orthodox approach.

Cf. Robert Looney, "Mexico's Fiscal Crisis: A Critique of the Fitzgerald Thesis." Paper presented at the Eastern Economic Association Meetings, Philadelphia, Pa. (April 1981).

Quantitatively the Bank of Mexico's reserve money (BMRM) is clearly a function of its largest component, commercial bank reserves (CBR), although these reserves by themselves only account for about 75 percent of the variation in BMRM (Table A4). Clearly, the government deficit (GDEF) is a significant variable (equation 5, Table A4). On the other hand, reserve assets of the bank (BMFA) were related to nominal exports (EXPTNA) and imports (Z). For reasons outlined below in the discussion of the reserve flow mechanism, real income proved significant in each regression in which it was introduced.

Bank of Mexico credit to the government (BMGC) was found to be explained almost completely by government expenditures (GENAN):

$$\text{BMGC} = 2.03 \text{ GENAN} - 12.15$$

$$(7.14) \quad (-4.23)$$

$$r^2 = 0.982; F = 960.47;$$

$$DW = 1.99$$

One implication of this linkage is the inherent tendency toward fiscal disequilibrium that began building up in the late 1960s.<sup>11</sup> Price stabilization and development objectives were to a certain degree becoming increasingly incompatible, especially during times when one goal was pursued more vigorously than the other. Given the policy framework at the time, the development goal required that output grow at the highest annual rate possible. Government expenditures were, therefore, promoted to the extent possible on the assumption that increased total demand would, through increasing private profitability, further induce private sector investment. Under Keynesian conditions of general unemployment, demand stimulations might have been expected to result in increased real output at relatively constant prices. Given the structural nature of much of Mexico's unemployment, however, price stability and high rates of growth became conflicting goals.<sup>12</sup> The bank was thus placed in the position whereby, in order to finance the increased level of government expenditures, it had to either create new money or reduce the amount of credit available to the private sector. Clearly, whenever new money was created in excess of the prevailing trend, additional pressure was exerted on prices.<sup>13</sup>

11. For a detailed analysis of this period, see Robert Looney, *Mexico's Economy: A Policy Analysis with Forecasts to 1990* (Boulder, Colorado: Westview Press, 1978), Chapter 5.

12. The classic statement of this problem is given in A. Navarette, "El Sector Público en el Desarrollo Económico," *Investigación Económica* (1957), 43-61.

13. L. Solís, *Economic Policy Reform in Mexico* (Elmsford, N.Y.: Pergamon Press, 1981), 19-24.

**Table A4 Mexico: Estimated Structural Equations—Bank of Mexico Block**  
1951-1979

*Bank of Mexico Reserve Money (BMRM)*

(1) BMRM = 2.31 CBRL - 0.39 BMGC - 1.76 E + 1.06 GENAN + 18.84 (16.64) (-1.63) (-4.57) (6.95) (2.86)	$r^2 = 0.989$ ; F = 509.54
(2) BMRM = 3.24 CBR - 571.98 DUMEX + 577.39 DUMDV + 1.80 DUMTDV + 0.36 (12.47) (-7.75) (8.14) (0.078) (0.016)	$r^2 = 0.945$ ; F = 98.29
(3) BMRM = 1.97 CBRL + 3.54 $\Delta$ EX - 0.76 EX - 1.11 GDEFL + 129.54 (12.23) (1.24) (-4.23) (-3.89) (4.55)	$r^2 = 0.976$ ; F = 278.94
(4) BMRM = 2.28 CBRL - 0.76 BMGC + 1.49 CPI + 0.29 INFD - 49.79 (9.79) (-2.45) (2.67) (0.28) (-1.95)	$r^2 = 0.968$ ; F = 205.68
(5) BMRM = 1.44 CBR - 3.34 GDEF - 2.23 BMGC - 20.72 (2.63) (-3.80) (-2.62) (-1.60)	$r^2 = 0.873$ ; F = 54.81
(6) BMRM = 0.64 BMGC - 1.28 CBR + 2.64 CBRL + 8.81 (7.08) (-9.55) (24.87) (3.53)	$r^2 = 0.993$ ; F = 1042.12

*Reserve Assets (BMFA)*

(7) BMFA = 0.20 EXPTNA + 0.0056 GDPNP + 0.21 (37.61) (4.48) (0.33)	$r^2 = 0.994$ ; F = 1975.56
(8) BMFA = 0.22 EXPTNA + 0.12 Z + 0.015 GDPNP + 1.66 (5.70) (2.96) (5.43) (4.89)	$r^2 = 0.994$ ; F = 1567.05
(9) BMFA = 0.16 EXPTNA - 11.11 DUMEX + 1.60 EX + 5.15 DUMDV - 3.75 DUMTDV - 12.91 (9.12) (-2.50) (2.93) (7.97) (-1.61) (-2.72)	$r^2 = 0.992$ ; F = 678.99
(10) BMFA = 0.21 EXPTNA + 2.56 (47.60) (6.01)	$r^2 = 0.989$ ; F = 2265.76

### International Causes of Expansion of the Money Supply

External factors were perhaps nearly as responsible during this period for the monetary acceleration as the government deficits. External reserves increased at an unusually high rate in both 1971 and 1972 (and as shown below these increases were systematically related to money supply changes).

During 1966–70, the country maintained a ratio of reserves to imports of around 0.32. In 1970 the ratio was still 0.32, but increased to 0.40 and 0.41 in 1971 and 1972, respectively. Since the government attempted to maintain reserves in a relatively fixed relation to imports, the 1971 and 1972 deviations from the 1960s average is indicative of the extent to which the country suddenly acquired excess reserves.

Another indicator of the degree to which the 1971–72 reserve accumulation was excessive is the increase in reserves in 1971 and 1972 compared with the long run degree of fluctuation (both positive and negative) in the country's reserves. For the base period 1965–69, typical reserve fluctuations were calculated as the average absolute value of the annual percentage reserve change. By this measure the country had a 0.0 average annual rate of change. In 1970, however, reserves increased by 12.4, and 22.3 in 1972, but down to 3.0 in 1974.

These measures strongly support the conclusion that there was an unusual increase in the country's international liquidity in 1971–72. In order to identify the channels of transmission of external inflation, however, it is necessary to determine whether the increase was due to changes in the trade balance (which primarily would reflect commodity prices and movements in real activity) or to capital flows (which are the result of monetary factors).

Both the level and the change of the trade balance are relevant for the analysis of the changes in reserves. Because the country had negative trade balances and thus used borrowing to cover trade deficits, an unanticipated improvement in the trade balance might have led to an increase in reserves (if capital flows including borrowing were kept at planned levels). Both the size of the trade deficit and the change over the previous year, however, do not suggest a partial role for trade in expanding reserve changes since the country's trade balance deteriorated from \$888 million in 1970 to \$893 in 1972, \$1,515 million in 1973 to \$2,792 million in 1974.

It appears, therefore, that a greater part of the expansion of reserve changes in the early 1970s lies in the behavior of the capital markets rather than with the trade balance. Moreover, it is likely



that the reserve growth caused the money supply growth. Again, because the country lacked developed financial institutions (to the extent that open market operations could be conducted on a large scale), reserve changes were likely to have a direct and immediate effect on the domestic liquidity; i.e., since capital inflows and reserve increases generally are not sterilized in Mexico,<sup>14</sup> their expansion thus results in a corresponding increase in the domestic money supply.

Changes in the country's money supply and reserves during the period of fixed exchange rates 1956-72 indicates that the money multiplier associated with a change in reserves was 1.6; i.e.,

$$\text{GM1} = 3.72 + 1.61 \text{ GR} \quad (3.6) \quad r^2 = 0.712$$

where GM1 = annual growth in M1 money; GR = annual growth in reserves.

These results suggest the importance of reserve changes in influencing movements in the money supply. More elaborate estimates of the money supply (Table A5) function show it to be very stable, as either a function of the reserves of the commercial banks (CBR) with the Bank of Mexico, or as a lagged function of Bank of Mexico reserve money (BMRM, BMRML, BMRML2).

Combined with the information on reserve growth, these results suggest that the Bank of Mexico's monetary policies were influenced to a considerable degree by external events and in particular by changes in the level of reserve assets. The precise role of sterilization policies cannot, however, be determined directly from the estimated equations since monetary expansion might have occurred in the absence of reserve changes. The result above does indicate, however, that changes in domestic money supply were strongly correlated with changes in reserves during this period. Considering the unusual expansion of reserves in the country in 1971 and 1972 that connection implies that the acceleration of money supply in 1972 and 1973 was strongly influenced by international as well as domestic factors.

One index that might be used to determine the external or imported contribution to money supply growth is the ratio of reserve changes to the previous year's money stock. Trends in this ratio should be indicative of the relative importance of external and internal factors responsible for money expansion.

As a basis of comparison, the ratio was 1.1 in 1966 rising to 2.1

14. B. Griffiths, *Mexican Monetary Policy and Economic Development* (New York: Praeger Publishers, 1972), 78-79.

in 1970, and up to 4.6 in 1972, falling to 3.5 in 1973 and 1.7 in 1975. Therefore, 1972 represents the greatest external contribution to the growth in the money supply.

### The Role of Public Policy

Many of the patterns noted above were reinforced by a series of ill-timed government policies.<sup>16</sup>

1) In 1970 the current account deficit of the balance of payments turned out to be almost twice as great as in the previous year. To reduce the current account deficit, a drastic cut in government spending was budgeted for 1971. Actual spending, however, was even lower than budgeted so the end result was that the government's deficit as a percentage of the Gross Domestic Product (GDP) was reduced from 1.5 in 1970 to 1.05 in 1971.

2) Considerable banking system resources, only partially utilized by the private sector, were freed by the sharp decline in government expenditures. Although the increase in the financial sector's real credit extended was at normal levels, financial institutions accumulated 2.7 billion pesos in excess reserves. The result was the severe economic slump in 1971 with real output growing at only 3.4 percent.

3) When the slippage of the growth rate became known and the existence of bank's excess reserves was disclosed, the government attempted to restore the traditional growth rate through increased expenditures. The budget deficit as a proportion of GDP more than trebled from 1971 to 1972.

4) Not only was public spending stepped up, but private investment increased substantially as well. Reserve requirements for banks and *financieras* were lowered in May 1972 when the recovery of output was in full swing.

5) Monetary ease came three months after the rate of change in industrial production had already increased above its long run growth trend.

6) Excess reserves were quickly exhausted and the Bank of Mexico, under the stress of a low rate of economic growth, abandoned its long run tradition of yearly changes of monetary targets (in line with long run trends) and attempted fine tuning by expanding domestic credit.

15. Summarized from Guillermo Ortiz and Leopoldo Solís, "Financial Structure and Exchange Rate Experience," *Journal of Development Economics* (1979): 515-548.

**Table A5 Mexico: Estimated Structural Equations—Money Supply Block**  
1951-1979

*Narrow Money Supply (M1)*

(1) $M1 = 0.17 \text{ CBR} + 0.12 \text{ GDPN} + 17.57 \text{ DUMDU} - 14.22 \text{ DUMEX} - 0.26$ (5.45) (43.09) (2.92) (-2.77) (-0.34)	$r^2 = 0.999$ ; $F = 12891.7$
(2) $M1 = 0.18 \text{ CBR} + 0.12 \text{ GDPN} + 13.62 \text{ DUMDU} - 11.55 \text{ DUMEX} - 0.68 \text{ EXL} + 7.39$ (5.81) (39.34) (2.19) (-2.23) (-1.69) (1.61)	$r^2 = 0.999$ ; $F = 11187.3$
(3) $M1 = 1.35 \text{ CBR} - 96.52 \text{ DUMEX} + 177.43 \text{ DUMDU} + 26.65$ (8.60) (-2.24) (4.15) (6.48)	$r^2 = 0.992$ ; $F = 703.87$
(4) $M1 = 0.90 \text{ CBR} - 83.86 \text{ DUMEX} + 125.03 \text{ DUMDU} + 17.92 \text{ MI} - 4.29 \text{ MID} - 108.66$ (11.93) (-3.92) (6.66) (10.86) (-3.48) (-6.68)	$r^2 = 0.994$ ; $F = 849.15$
(5) $M1 = 0.28 \text{ CBR} + 31.47 \text{ DUMDU} - 17.38 \text{ DUMEX} + 4.23 \text{ MI} + 0.93 \text{ MIL} - 32.77$ (4.25) (2.60) (-1.52) (3.23) (12.66) (-3.24)	$r^2 = 0.999$ ; $F = 4671.22$
(6) $M1 = 0.67 \text{ BMRM} + 27.53$ (10.46) (3.11)	$r^2 = 0.814$ ; $F = 109.49$
(7) $M1 = 0.49 \text{ BMRM} + 0.38 \text{ BMRL} + 22.56$ (5.52) (2.79) (2.80)	$r^2 = 0.859$ ; $F = 73.43$
(8) $M1 = 0.38 \text{ BMRM} + 0.38 \text{ BMRML} + 0.88 \text{ BMRML2} + 2.48$ (9.13) (6.24) (9.76) (0.60)	$r^2 = 0.969$ ; $F = 272.83$
(9) $M1 = 0.35 \text{ BMRM} + 0.33 \text{ BMRML} + 0.69 \text{ BMRML2} + 37.09 \text{ DUMEX} + 7.15$ (8.50) (5.15) (5.18) (1.96) (1.55)	$r^2 = 0.977$ ; $F = 230.78$
(10) $M1 = 0.28 \text{ BMRM} + 0.35 \text{ BMRML} + 0.68 \text{ BMRML2} + 69.50 \text{ DUMEX} - 78.93 \text{ DUMDU} + 8.61$ (13.44) (11.50) (10.68) (7.07) (-8.63) (3.88)	$r^2 = 0.995$ ; $F = 816.6$

- (11)  $M1 = 0.26 \text{ BMRM} + 0.34 \text{ BMRML} + 0.67 \text{ BMRML2} + 93.13 \text{ DUMEX} - 86.75 \text{ DUMDU} - 3.97 \text{ MID} + 29.73$   $r^2 = 0.997$ ;  $F = 1237.12$   
                   (15.54)           (14.44)           (14.09)           10.15)           (- 12.33)           (- 4.25)           (5.68)
- (12)  $M1 = 0.029 \text{ BMRM} + 0.26 \text{ GDPN} + 0.049 \Delta \text{ GDPN} - 1.56$   $r^2 = 0.999$ ;  $F = 7364.45$   
                   (2.35)           (16.05)           (1.86)           (- 1.20)
- (13)  $M1 = 0.075 \text{ CBR} + 0.028 \text{ CBRL} + 0.13 \text{ GDPN} - 1.05$   $r^2 = 0.998$ ;  $F = 4971.8$   
                   (3.57)           (2.03)           (13.97)           (- 1.37)
- Supply of Broad Money (M2)*
- (14)  $M2 = 1.24 \text{ BMRM} + 0.75 \text{ BMRML} + 16.58$   $r^2 = 0.842$ ;  $F = 64.05$   
                   (5.54)           (2.17)           (0.81)
- (15)  $M2 = 1.03 \text{ BMRM} + 0.76 \text{ BMRML} + 1.69 \text{ BMRML2} - 21.88$   $r^2 = 0.914$ ;  $F = 81.84$   
                   (5.89)           (2.91)           (4.40)           (- 1.23)
- (16)  $M2 = 0.53 \text{ BMRM} + 0.45 \text{ BMRML} + 0.24 \text{ BMRML2} - 334.97 \text{ DUMDU} + 395.18 \text{ DUMEX} -$   $r^2 = 0.999$ ;  $F = 3618.31$   
                   (19.42)           (8.49)           (1.51)           (- 25.02)           (30.22)  
                   6.17 MID + 5.58 MI + 1.41  
                   (- 5.07)           (1.33)           (0.041)
- (17)  $M2 = 0.55 \text{ BMRM} + 0.51 \text{ BMRML} + 0.43 \text{ BMRML2} - 347.97 \text{ DUMDU} + 402.29 \text{ DUMEX} -$   $r^2 = 0.999$ ;  $F = 4064.67$   
                   (24.93)           (16.49)           (6.79)           (- 37.34)           (33.09)  
                   6.09 MID + 45.44  
                   (- 4.92)           (0.55)
- (18)  $M2 = 1.47 \text{ CBR} + 0.14 \text{ CBRL} + 0.13 \text{ GDPN} - 0.24$   $r^2 = 0.998$ ;  $F = 4882.2$   
                   (17.67)           (1.57)           (14.34)           (- 0.076)

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NOTE: See Appendix A for definition of symbols.

Ordinary least squares estimates; TSP estimation program.

7) As noted above prices reacted with a lag. It was not until the second semester of 1972 when the wholesale price index started rising gradually. In January of 1973 the annual rate of change of this index was already 7.3 percent; by December of that year it had increased to 25.5 percent.

8) At the end of May 1973 much too late, and in the face of accelerating inflation, the Bank of Mexico reversed its policy of monetary ease by raising reserve requirements for financieras and banks. Interest rates were also increased later that year. By that time, however, these measures were largely symbolic.

9) The government's deficit as a proportion of GDP increased by 35 percent in 1973 and the money supply grew at a rate of 24.1 percent. The rate of inflation turned out to be 15.7 percent for that year and for the first time since the 1950s real interest rates on financial savings became negative. This trend continued until 1976.

From the analysis in the sections above, it appears that there is adequate evidence to warrant a more detailed examination of the monetarist explanation of the country's inflationary process during this period.

### A Monetarist Model of Inflation

The monetarist approach is a logical one to use in examining Mexico's price movements since many of the conditions in the country are consistent with its underlying assumptions: (1) although the economy is large by most standards, it is still relatively small in the sense that the prices of such important items as capital goods are largely determined in world markets, and (2) even though Mexico is considered a less developed country, it does have a relatively advanced financial sector, headed by a central bank which, over most of the period in question, was responsible for influencing the external balance (the balance of payments) as well as domestic credit conditions.

Thus Mexico provides not only the conditions necessary for testing a monetary model,<sup>16</sup> but also some interesting insights into the model's policy implications, especially with regard to the nature and causes of inflation experienced by the country.

16. In particular see the analysis of D. Sykes Wilford in *Monetary Policy and the Open Economy: Mexico's Experience* (New York: Praeger Publishers, 1977), Chapter 3; Bluford Putnam and D. Sykes Wilford, *The Monetary Approach to International Adjustment* (New York: Praeger Publishers, 1978); and D. Sykes Wilford and J. Richard Zecher, "Monetary Policy and the Balance of Payments in Mexico, 1955-1975," *Journal of Money, Credit, and Banking* (August 1979): 340-348.

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The monetary approach to inflation in Mexico developed here is similar to the monetarist approach developed by Wilford to explain movements in the country's balance of payments; i.e., it starts with the fundamental proposition that inflation is merely an interaction of market supply and demand for money. Put differently, price movements are viewed by this model as systematically dependent upon current and immediate past evolutions of the interaction between supply and demand conditions, and with movements (Table A6) in the U.S. or world rate of inflation.<sup>17</sup>

The starting point of this analysis is the basic monetarist model derived from the equation of exchange.<sup>18</sup> More specifically, assume a simple money demand function of the following form:

$$(1) M/PY = Y^a C^b$$

where M is the (exogenously determined) nominal stock of money, P is the price, Y is a measure of real income, and C is the expected cost of holding real balances. Equation (1) is solved for P and expressed in terms of growth rates (or depicted by G prefixing the variable):

$$(2) INF = RM - (1 - a) GY - bGC$$

Equation (2) incorporates the basic elements of the monetarist approach to inflation: money, real income, and the expected cost of holding real balances. In addition this formulation captures the basic methodological bias of the monetarist school; i.e., the equation has a limited number of variables, and the nature of relationships is clear and straightforward. The growth of money relative to output and cost of holding real balances will generate an increase in the rate of inflation. The growth of real income will cause decreases in the rate of inflation (via absorbing money in the increased demand for real balances). Similarly, the rate of inflation is assumed to be inversely related to the expected cost of holding real balances.

Equation (2) assumes instantaneous adjustment of monetary changes and no money illusion. Therefore, the tested form of the monetarist equation is:

17. As formed here and by D. Sykes Wilford, "Price Levels, Interest Rates, Open Economies and a Fixed Exchange: The Mexican Case 1954-1974," *Review of Business and Economic Research* (Spring 1977): 52-65. See, however, Francis W. Ahking, "Mexico: The Open Economy—A Note," *Review of Business and Economic Research* (1980), 103-107, for a discussion of the statistical limitations in drawing conclusions as to the validity of the unified goods market for Mexico and the U.S.

18. The formulation used follows that of Harberger. Cf. Arnold Harberger, "The Dynamics of Inflation in Chile," in C. Christ, ed., *Measurement in Economics* (Stanford, Calif.: Stanford University Press, 1963), and R. Vogel, "The Dynamics of Inflation in Latin America, 1950-1969," *American Economic Review* (March 1974): 102-114.

**Table A6** *Changes in Money and Real Wages in Mexico and the United States, 1968–1980*  
1968 = 100

	<i>Mexican Average Money Wage</i>		<i>Urban Minimum Wage Real Wage<sup>1</sup></i>		<i>Average Real Manufacturing Wages Mexico</i>		<i>United States<sup>2</sup></i>	
	<i>Index</i>	<i>Annual % Change</i>	<i>Index</i>	<i>Annual % Change</i>	<i>Index</i>	<i>Annual % Change</i>	<i>Index</i>	<i>Annual % Change</i>
1968	100	–	100	–	100	–	100	–
1969	100	0.0	96.6	– 3.4	102.6	2.6	103.2	3.2
1970	116.3	16.3	107.0	10.8	103.5	0.9	103.8	0.7
1971	116.3	0.0	101.5	– 5.1	106.0	2.4	106.5	2.6
1972	137.6	18.3	114.4	12.7	108.5	2.4	109.7	3.0
1973	144.7	5.2	107.3	– 6.2	108.8	0.3	109.7	0.0
1974	196.7	35.9	117.9	9.9	113.2	4.0	106.7	– 2.7
1975	228.2	16.0	119.0	0.9	118.6	4.8	105.9	– 0.7
1976	295.0	29.3	132.8	11.6	129.3	9.0	107.3	1.3
1977	337.3	27.9	131.6	– 0.9	131.9	2.0	108.4	1.0
1978	428.1	13.5	127.1	– 3.4	127.8	– 3.1	109.0	0.6
1979	500.0	16.8	125.6	– 1.2	–	–	105.6	– 3.1
1980 <sup>3</sup>	589.0	17.8	141.1	12.3	–	–	102.5	– 5.5

(January)

SOURCE: Bank of Mexico, *Precios, Cuaderno Mensual, Febrero 1980*, constructed from Tables 7 to 11; and US data from Economic Indicators, February 1980, Washington, D.C.

- (1) Index of money wage increases corrected for inflation by dividing by the national consumer price index for each country.
- (2) Index of hourly earnings in private non-agricultural industries (constructed from US Economic Indicators, February 1980). For statistical convenience, I took this measure of wage increases rather than manufacturing wages. From 1970 to January 1980, manufacturing gross hourly earnings in current dollars were at a higher level than total non-agricultural, and in those ten years, manufacturing rose by 4.3% more than total non-agricultural.
- (3) For Mexico, the January figure is the annual increase for 1980, which will be eroded by inflation as the year goes by. For the United States, it is the percentage change from January 1979.

$INFW = a + a_1GM + a_2GML + GML2 - GGDPNP + INFWE$   
 where  $GGDPNP$  is the growth of real gross domestic product;  $GML$  is the growth of the money supply (either  $M1$  or  $M2$ ) lagged one year;  $GML2$  is the growth in the money supply lagged two years, and  $INFWE$  is some measure of inflationary expectations (using the wholesale price index). Here  $INFWE$  is this rate of inflation minus last year's rate.<sup>19</sup>

The basic monetarist contention is: (1) that the causal relation runs from money to prices and output; (2) any persistent increase in money relative to output is a sufficient condition for inflation; (3) the magnitude and length of inflation is dependent on the magnitude and persistence of monetary growth; (4) the occurrence of inflation is independent of the level of employment in the economy, and (5) it is the increasing growth rate of money which yields inflationary pressures.

The results<sup>20</sup> of the monetary regressions on the rate of increase in the wholesale price index indicate that the monetarist model performs extremely well. Both the growth in  $M1$  and  $M2$  were used, with  $M1$  performing slightly better.

$GM1$  is highly significant explaining nearly 73 percent of the observed rate of inflation (equation 1, Table 2). Similar results (Table 3) were obtained for the rate of increase in the gap deflator ( $INF$ ) and the rate of increase in the currency price index ( $INFC$ ). When combined with other variables in the wholesale equations,  $GM1$  is still significant, rising to over 89 percent explanation of the variance in  $INFW$  when combined with  $GM2L$ , expected inflation  $INFWE$ , and the U.S. inflation ( $USINFC$ ), the ratio of imports to GDP ( $ZA$ ), and the growth in real GDP ( $GGDPNP$ ). In general the growth of U.S. prices gives somewhat better results than world inflation lagged one year.

The positive sign on the inflationary expectations term ( $INFWE$ ,  $INFCE$ ) as proxied by this year's rate of price increase minus last year's is of interest and has certain implications for monetary policy. The positive sign (equations 6, 7, 8 of Table 3; equations 3, 4, 5, 7, 8 of Table 2) indicates that with increased inflation, individuals may

19. In the original, Harberger formulation inflationary expectations were approximated by the rate of inflation last year minus the rate two years prior. The formulation used here gave slightly better results.

20. The equations were also estimated using the Cochrane—Orcutt iterative technique to correct for serial correlation of the error terms. While some serial correlation was found, the results obtained were essentially the same as those presented. Estimations were made using Time Series Processor version 3.5C. See Bronwyn Hall and Robert E. Hall, *Time Series Processor* (Stanford Calif: Hall and Hall, 1980) for the documentation on this procedure.



**Table 2 Mexico: Monetary Determinants of Inflation**  
1951-1980

Dependent		Independent Variables										RHO	Intercept	r <sup>2</sup>	F
Variable	Equation	GM1	GM1L	1NFWE	US1NFC	GM2	GM2L	ZA	GGDPNP						
Rate of Inflation	(1)	0.97 (8.11)									-0.03 (-0.17)	-5.98 (-3.25)	0.725	65.91	
(Wholesale price index)	(2)	0.71 (4.32)	0.37 (2.15)								0.04 (0.22)	-7.28 (-3.70)	0.744	34.95	
	(3)	0.43 (3.48)	0.54 (4.53)	0.45 (5.50)							0.40 (2.24)	-5.99 (-2.93)	0.813	30.56	
	(4)	0.33 (2.65)	0.45 (3.65)	0.45 (6.06)	0.43 (1.68)						0.17 (2.89)	-5.41 (-2.45)	0.822	23.09	
	(5)	0.49 (3.50)	0.61 (3.92)	0.45 (4.46)	0.26 (1.03)			1.08 (2.36)	-0.42 (-1.55)			16.47 (-3.98)	0.891	25.88	
	(6)					0.56 (7.06)	0.15 (1.80)				0.26 (1.39)	-3.17 (-2.00)	0.762	38.43	
	(7)			0.43 (3.54)	0.50 (2.66)	0.28 (3.13)	0.29 (3.18)					-3.56 (-3.62)	0.899	46.78	
	(8)			0.43 (3.12)		0.32 (3.18)	0.35 (3.54)					-3.08 (-2.83)	0.846	47.03	
	(9)				0.34 (3.77)	0.58 (10.65)			0.33 (2.73)						

Note: See text for definition of symbols.

**Table 3 Mexico: Estimated Structural Equations—Inflation Block  
1951–1979**

*Inflation—Gross Domestic Product Deflator Measure (INF)*

(1) $INF = 0.66 \text{ GM1} + 0.46 \text{ GM1L} - 8.83$	$r^2 = 0.733$ ; $F = 31.56$ ;
(2.87) (2.48) (-4.30)	
(2) $INF = 0.84 \text{ GM1} - 0.636 \text{ GDPNP} - 0.51$	$r^2 = 0.776$ ; $F = 39.95$ ;
(7.10) (-3.44) (-0.20)	
(3) $INF = 0.616 \text{ M1} + 0.286 \text{ M1L} + 0.34 \text{ GM1L2} - 9.99$	$r^2 = 0.774$ ; $F = 25.17$ ;
(3.75) (1.43) (2.01) (-4.97)	
(4) $INF = 0.57 \text{ GM1} + 0.45 \text{ GM1L} - 0.62 \text{ GGDPNP} - 2.58$	$r^2 = 0.845$ ; $F = 40.08$ ;
(4.16) (3.12) (-4.00) (-1.15)	
(5) $INF = 0.51 \text{ GM1} + 0.32 \text{ GM1L} + 0.28 \text{ WINF} - 0.56 \text{ GGDPNP} - 1.84$	$r^2 = 0.877$ ; $F = 37.38$ ;
(4.07) (2.23) (2.32) (3.88) (-0.89)	
(6) $INF = 0.54 \text{ GM1} + 0.47 \text{ GM1L} - 0.77 \text{ GGDPNP} + 0.03 \text{ INFE} - 1.63$	$r^2 = 0.866$ ; $F = 33.89$ ;
(4.18) (3.42) (-4.53) (1.99) (-0.74)	

*Inflation—Consumer Price Index Measure (INFC)*

(7) $INFC = 0.30 \text{ GM2} + 0.24 \text{ GM2L} + 0.31 \text{ INFCE} + 0.38 \text{ WINF} - 59.71 \text{ ZB} - 8.36$	$r^2 = 0.828$ ; $F = 19.29$ ;
(2.83) (2.08) (2.32) (2.66) (-1.66) (-1.96)	
(8) $INFC = 0.276 \text{ M2} + 0.29 \text{ GM2L} + 0.34 \text{ WINF} + 0.35 \text{ INFCE} - 1.64$	$r^2 = 0.804$ ; $F = 21.61$ ;
(2.53) (2.53) (2.30) (2.54) (-1.14)	

have actually increased their holdings of money, an apparently irrational move since inflation was eroding the value of these holdings at the time. This, however, can to some extent be explained by the financial structure of the country, which can be characterized by:<sup>21</sup>

1) greater reliance of firms on internal financing than on the issuance of new securities; 2) only limited activity in the domestic stock exchange with new securities being mainly purchased by the financial institutions rather than the non-bank private sector, and 3) deposits with the monetary system constituting the major portion of the public's claims on the financial intermediaries. Given the relative lack of alternative assets and financial instruments, increased money holdings during periods of inflation is not as irrational as it might at first appear.

### Conclusions

Based on the Mexican experience with inflation in the 1970s, it is clear that any meaningful framework for the analysis of Mexican inflation in the 1980s must systematically take into account the role of money in the economy. It should not be inferred from this analysis, however, that inflation in the 1980s is necessarily the result of an identical set of forces or mechanisms present in the 1970s.

On the other hand, it is apparent that the tendency of Mexican presidents to minimize the role of money or government actions in affecting price change created an environment in the early 1980s conducive to monetary expansion. For example, President López Portillo argued in his 1979 *Informe* that: 1) Mexico's inflation was due largely to the time consuming process of production, "the natural lack of synchronization with the consequent waiting period between investment and output of the final product;" 2) oil subsidies to consumers were viewed as reducing private expenditure thus moderating inflation; and 3) a considerable part of the inflation was attributed to the rising prices of imports.<sup>22</sup>

In his 1979 *Informe* the President further noted that there was no certain cure for inflation "for the world has been struggling to eradicate it for six years." He also declared that Mexico was doing its best to control domestic inflation, but since it was suffering from

21. Francis Lees and Maximo Eng, *International Financial Markets: Development of the Present System and Future Prospects* (New York: Praeger Publishers, 1975), Chapter 18.

22. As reported in *Comercio Exterior de Mexico* (September 1979): 312-315.

many shortages, "it would be unfair to fight inflation by preventing these from being converted into demand. . . ." The remedy was to improve supply "by increasing the flow of basic consumer goods," and if this could not be done through the "existing structure," the government must step in.<sup>23</sup>

23. Ibid.

#### APPENDIX A Definition of Symbols

BMRM	= Bank of Mexico Reserve Money
BMGC	= Bank of Mexico Credit to Government
E,EXPTNA	= Nominal Exports (National Income Accounts)
GENAN	= Government Expenditures (Consumption & Investment, National Income Accounts)
DUMEX	= Dummy Variable; 0, 1951-75 1, 1976-80
DUMDV	= Dummy Variable; 0, 1951-75 0, 1977-80 1, 1976
DUMTDV	= Dummy Variable; 0, 1951-53 1, 1954-75 2, 1976-80
CBR	= Commercial Bank Reserves
EX	= Peso-dollar exchange rate
GDEF	= Government deficit (Government revenue minus government expenditure)
CPI	= Consumer price index
INFD	= Mexican-United States inflation rate
MI	=
GDPN	= Minimal Gross Domestic Product
MI	= Mexican short term interest rate
MID	=
MZ	=
GYN	= Growth normal GDP
INF	= Mexican inflation
R	= Net foreign assets of Bank of Mexico
D	= Domestic assets of Bank of Mexico
GR	= Average annual growth in net foreign assets
GD	= Average annual growth in Bank of Mexico domestic credit
GI	= Average annual growth in Mexican short term interest
GY	= Growth in real gross domestic product

INFWE	=	Rate in current year minus inflation previous year (wholesale prices)
USGDP	=	United States gross domestic product
IWFW	=	Rate of inflation (wholesale prices)
DFGDP	=	GDP deflator
A	=	Change (current year value minus previous year value)
L <sub>t</sub> at end of symbol	=	Value lagged one year
L <sub>2</sub> at end of symbol	=	Value lagged two years